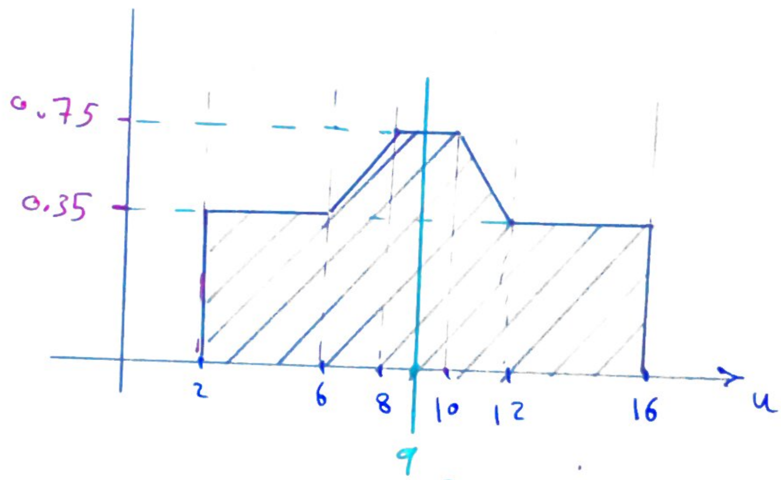
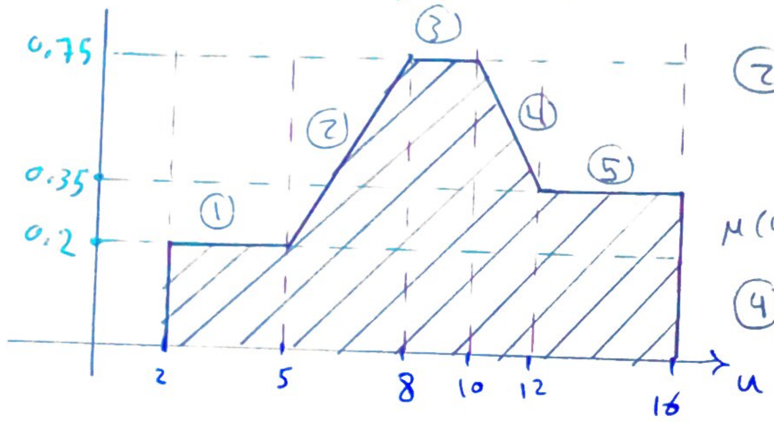
2/11/2016 الأربعاء مراجعة سكشن [4]

[1] Find the crisp output of the fuzzy ~~set~~ controller that has the following overall fuzzy output as shown in the following cases:-

A)



B)



0.75 0.2

(2) $\frac{\mu(u) - \mu_1(u)}{u - u_1}$

$\mu(u) = \frac{0.55}{3} u - \frac{2.15}{3}$

(4) $\mu(u) = 0.2u + 2.75$

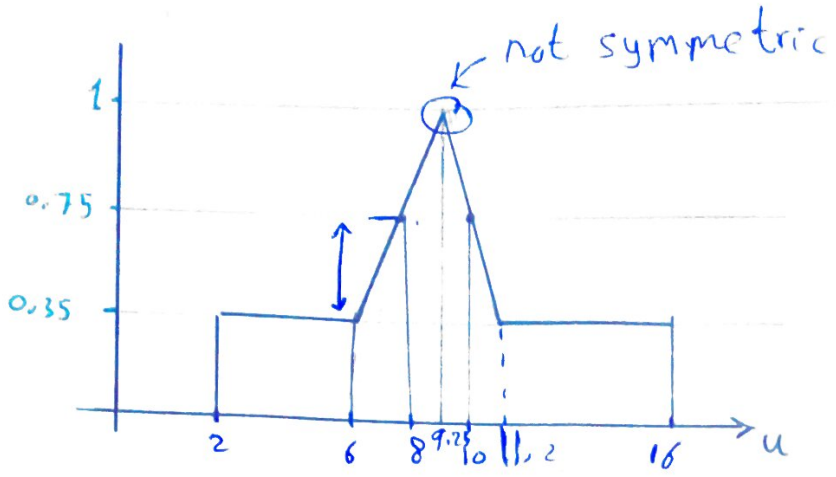
A) $U^{crisp} = \frac{\sum \mu(u_i)\, u_i}{\sum \mu(u_i)} = \frac{0.75 * 9}{0.75} = 9$

B) $U^{crisp} = \frac{\int \mu(u)\, u\, du}{\int \mu(u)\, du} = \frac{I_1}{I_2}$

$$I_1 = \int_2^5 0.2u\,du + \int_5^8 \left(\frac{0.55}{3}u - \frac{2.15}{3}\right)u\,du + \int_8^{10} 0.75\,u\,du + \int_{10}^{12} (-0.2u + 0.75)\,u\,du + \int_{12}^{16} 0.35\,u\,du$$

$$I_2 = \int_2^5 0.2\,du + \int_5^8 \left(\frac{0.55}{3}u - \frac{2.15}{3}\right)du + \int_8^{10} 0.75\,du + \int_{10}^{12} (-0.2u + 0.75)\,du + \int_{12}^{16} 0.35\,du$$

$U^{crisp} = \frac{I_1}{I_2} = 12.3$



$\mu(u) = 0.2u - 1.2 + 0.35$

$\mu(u) = 0.2u - 0.85$

$1 = 0.2u - 0.85$

$u = \frac{1.85}{0.2} = 9.25$

Not Symmetrical

\# $\frac{\mu(u)-1}{u-9.25} \times \frac{-0.25}{0.75} = \frac{-1}{3}$

$3\mu(u) - 3 = -u + 9.25 \Rightarrow \mu(u) = \frac{-u}{3} + \frac{12.25}{3}$

\# $0.35 = \frac{-u}{3} + \frac{12.25}{3}$

$0.35 * 3 - 12.25 = -u \Rightarrow u = 11.2$

$u^{crisp} = \frac{\int \mu(u)\, u\, du}{\int u(u)\, du} = \frac{I_1}{I_2}$

$I_1 = \int_2^6 0.35u\,du + \int_6^{9.25} (0.2u - 0.85)u\,du + \int_{9.25}^{11.2} \left(\frac{-u}{3} + \frac{12.25}{3}\right)u\,du + \int_{11.2}^{16} 0.35u\,du$

$= \checkmark$

$I_2 = \checkmark \Rightarrow u^{crisp} = \frac{I_1}{I_2} = \checkmark$

2)

$e, \Delta e \rightarrow \{NM, NS, Z, PS, PM\}$

$u \rightarrow \{NL, NM, NS, Z, PS, PM, PL\}$

$e \rightarrow -4 \rightarrow 4$

$\Delta e \rightarrow -1 \rightarrow 1$

$u \rightarrow -9 \rightarrow 9$

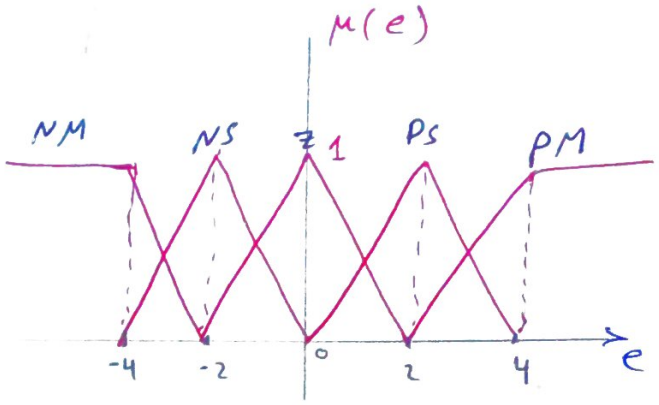
Find u^{crisp}

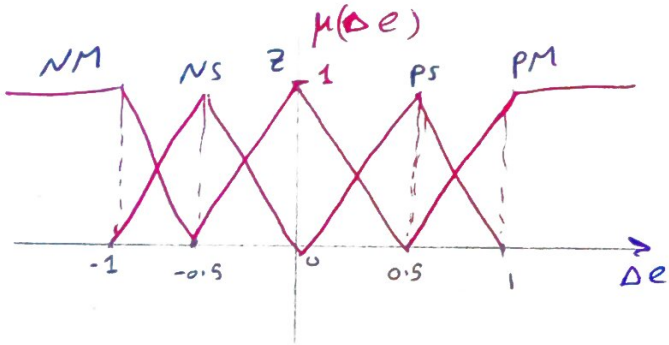
① $e = 3$ and $\Delta e = -0.5$

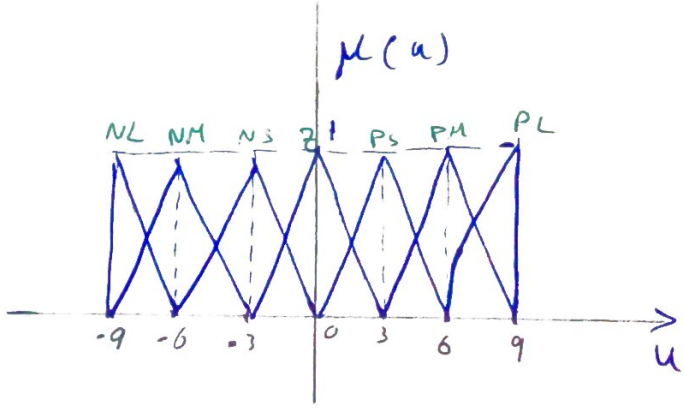
② $e = -2$ and $\Delta e = -0.2$

③ $e = 2.6$ and $\Delta e = 0.35$

Δe \ e	NM	NS	Z	PS	PM
NM	PL	PL	PM	PS	Z
NS	PL	PM	PS	Z	NS
Z	PM	PS	Z	NS	NM
PS	PS	Z	NS	NM	NL
PM	Z	NS	NM	NL	NL







① Fuzzification

$e = 3 \rightarrow PS \rightarrow \mu = 0.5$ (PS)

$\rightarrow PM \rightarrow \mu = 0.5$ (PM)

$\Delta e = 0.5 \rightarrow NS \rightarrow \mu = 1$ (NS)

[2] fired rules

R1 : if e is PS and Δe is NS then u is Z

R2 : if e is PM and Δe is NS then u is NS

[3] the grade or degree of premise part.

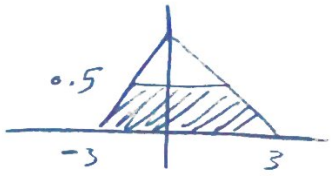
$R1 \rightarrow \mu_{P_1} = \min\{\mu_{PS}(e) ; \mu_{NS}(\Delta e)\} = \min(0.5, 1) = 0.5$

$R2 \rightarrow \mu_{P_2} = \min\{\mu_{PM}(e) ; \mu_{NS}(\Delta e)\} = \min\{0.5, 1\} = 0.5$

[4] the fuzzy forms of the outputs

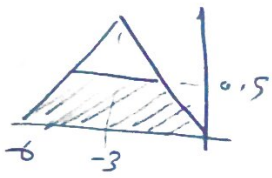
$R1 \Rightarrow \mu_Z(u) = \min\{\mu_{P_1}, \mu_Z(u)\} = \min\{0.5, \mu(u)\}$

$R2 \Rightarrow \mu_{NS}(u) = \min\{\mu_{P_2}, \mu_{NS}(u)\} = \min\{0.5, \mu_{NS}(u)\}$



[5] ~~Defuzzification~~ Defuzzification

$u^{crisp} = -1.5$



for input in [2] and [3]

you will do the same as in [1]